their general scope. One group deals with elastic hysteresis in steel and the endurance of that metal under repeated cyclic variations of stress. For these experiments he designed an ingenious "fatigue-tester" to apply alternations of pull and push at a rate as high as 7000 per minute by using electro-magnetic action to maintain the vertical oscillation of a heavy armature attached to one end of the test-piece. Another important group of papers deals with gaseous explosions. His researches in this subject have done much to clear away earlier misconceptions and to bring out features in the process of explosion that had been overlooked. They disposed of wrong ideas about "after-burning," but at the same time showed how far from uniform is the condition within a closed combustion-vessel at the moment when the maximum pressure is attained.

As joint secretary with Sir Dugald Clerk of the British Association Committee on Gaseous Explosions, as well as by his own experiments, Hopkinson did much to advance our knowledge of an intricate problem. He applied similar methods of inquiry to the analysis of what occurs in an internal-combustion engine; in this connection his optical indicator is of great service. During the years immediately before the war he was engaged in studying the pressure produced by the detonation of high explosives and by the impact of bullets. For this he devised methods of measurement which were admirably simple and effective. They were described in a Royal Institution lecture in 1912, and more fully in the Philosophical Transactions of the Royal Society for 1914. Hopkinson also edited a reprint of his father's scientific and technical papers, and wrote for it a short memoir, which was published in 1901.

On the outbreak of war he threw himself with characteristic vigour into national service, to the exclusion of all other interests. At Cambridge he had been a keen promoter of the Officers Training Corps. He first undertook R.E. duty at Chatham in order to relieve others for active service. Later he was engaged for a time at the Admiralty on work of a kind quite new to him, which he attacked with conspicuously good effect. He had the satisfaction of seeing an invention, which he made to meet one of the bigger difficulties of the war, promptly tested, adopted, and officially recognised. Concurrently with this he acted as secretary of a committee set up by the Royal Society to assist the Government, a position which brought him into touch with many other war questions and with the men busied in them. His attention began to be directed to the equipment of aircraft, and soon he became absorbed in this task, accepting a position in what is now the Royal Air Force. There, perhaps as never before, he found his opportunity. His powers were acknowledged and turned to full account; he received promotion, and the range of his authority was enlarged. He revelled in his work, put everything aside for it, was unsparing of himself. He knew well that flying, especially for a man no longer young, meant a serious risk; but he felt that the risk had to be taken if the work were to be well done. So he flew, from one air station in England to another, or even to France, generally as his own pilot.

All who knew Hopkinson esteemed him for a man of strong character and sane judgment, of unswerving straightness in thought and action, with a rare freedom from egotism or self-seeking or any pettiness. But it was only in the intimacy of the domestic circle that one learnt what a wealth of affection lay behind his reserve. In 1903 he married the eldest daughter of Mr. Alexander Siemens; she survives him with seven daughters. His family life was an ideally happy one save for the calamity of 1898 and for the death of his brother Cecil, a young man of like tastes and of the finest promise, who died last year of a wound received in Flanders. In claiming them both, the War has taken of our very best.

J. A. EWING.

NOTES.

THE Società Italiana delle Scienze (detta dei XL) has awarded the natural sciences gold medal for 1918 to Prof. Filippo Eredia for his work in meteorology. This is the first time that, in Italy, studies in the field of meteorology have been rewarded in this way.

A TELEGRAM received at the Meteorological Office on August 26 from the Director-General of Observatories in India states, with reference to the Arabian Sea and Bay of Bengal, that the monsoon is normal, and that no cyclonic storm has occurred.

WE regret to note that *Engineering* for August 30 records the death of Engineer Rear-Admiral Francis Henry Lister. Admiral Lister was well known in the Service, and was closely identified with the construction of machinery in the contractors' works, not only for the Navy, but also for several ships ranked as auxiliaries to the Navy, including the *Mauretania* and *Lusitania*. His age was fifty-six years, and he had given thirty-nine years to the service of his country in the Navy. He was a member of the Institution of Naval Architects and of the Institution of Mechanical Engineers.

THE principle that every large industrial firm should have its own research laboratory appears to have been accepted more generally in America than it has been in this country, and as a consequence a large proportion of our knowledge of the working of such laboratories comes from American sources. In the August issue of the *Scientific Monthly* there is, for example, a valuable paper on research and industry by Dr. P. G. Nutting, the director of the Westinghouse Research Laboratory at East Pittsburgh. Dr. Nutting points out that in addition to technical research, such as the testing of the materials received and produced, the elimination of works troubles, and the starting of new processes, it is necessary to carry out scientific industrial research on basic principles, and on their relations to the more obscure and fundamental works troubles. He considers that the best preparation for industrial research as a profession is a thorough grounding in principles, followed by research sufficient to justify the award of a doctor's degree in the best American universities.

A ROYAL Commission has been appointed "to consider and report whether it is advisable to make any changes in the denominations of the currency and money account of the United Kingdom with the view of placing them on a decimal basis, and whether, if an alteration of the present system is recommended, it is desirable to adopt with or without modification the proposals embodied in the Bill recently introduced into the House of Lords by Lord Southwark or some other scheme, and in the latter alternative to make specific recommendations for consideration by Parliament." The members of the Commission are:—Lord Emmott, Lord Southwark, Lord Faber, Lord Ashton of Hyde, Lord Leverhulme, Sir R. V. Vassar-Smith, Bart., Sir J. Larmor, Sir G. Croydon Marks, Sir A. W. Watson, Mr. J. W. Cawston, Mr. S. Armitage Smith, Mr. C. Godfrey, Mr. J. Bell, Mr. J. Burn, Mr. H. Cox, Mr. G. Hayhurst, Mr. T. McKenna, Mr. G. Marks, Mr. J. F. Mason, Mr. A. Smith, Mr. G. M. Smith, and Mr. G. C. Vyle.

ALTHOUGH a reinforced-concrete barge of 400 tons has been in use on the cross-Channel service for some months, the vessel launched on August 24 at Lake Shipyard, near Poole, is the first 1000-ton reinforced-concrete sea-going barge completed in the United Kingdom, and forms one of a fleet of similar vessels at present in course of construction at Admiralty extension shipyards in different parts of England, Scotland, and Ireland. From an illustrated article in *Engineering* for August 30 we learn that there are now eight 1000-ton barges on the slips at the Lake yard, which was laid out to suit this class of work by Mr. Anthony G. Lyster, of Sir John Wolfe Barry and Partners. When finally completed, the slipways will provide accommodation for the simultaneous building of sixteen vessels ranging up to 2500 tons dead-weight carrying capacity. The vessels under construction were designed by Mr. E. O. Williams, the hull in every case having a double bottom and double sides. It is interesting to know that the experience gained in the building of this pioneer vessel has already resulted in the introduction of various improved methods of procedure. The vessel was constructed to the classification of the British Corporation for the Survey and Registration of Shipping.

THE death is announced of Prof. Henry Shaler Williams, of Cornell University, U.S.A. Prof. Williams was born at Ithaca, N.Y., on March 6, 1847, and graduated at Yale in 1868. His early inclinations were towards biology, and his first paper, in 1872, made a comparison between the muscles of the chelonian and human shoulder-girdles. Soon, however, he turned to the study of fossils, with special reference to their use in stratigraphical geology, and in 1879 he was appointed professor of palæontology in Cornell University. In 1886 he became professor of both geology and palæontology in the same university, and in 1892 he succeeded James D. Dana as Silliman professor at Yale. In 1902 he returned to Cornell, and in 1912 he retired from active service, with a pension under the Carnegie Foundation. Prof. Williams devoted his attention chiefly to the invertebrate fossils found in the Devonian formations of the eastern part of North America, and published an important series of memoirs on the correlation of these rocks and faunas in the Bulletin of the United States Geological Survey. At the same time he detailed the results of his researches, especially on brachiopods, in other papers, and in 1895 he produced a most useful and original handbook entitled "Geological Biology, an Introduction to the Geological History of Organisms." He was among the pioneers in the modern methods of studying fossils, and most industriously tested their value in the sphere which he made his own.

THE death of Dr. Robert Saundby on August 28, at the age of sixty-eight, leaves a gap in the ranks of contemporary leaders of British medicine. From his first appointment as pathologist at the Birmingham General Hospital in 1876 until his retirement from the University chair of physic in 1917, when he became emeritus professor, Dr. Saundby devoted himself to medical problems in their scientific aspects, especially in regard to abnormal states of the urine in renal disease and diabetes, and to disorders of the stomach and digestive system. His works on "Renal and Urinary Diseases" (fourth edition, 1900) and on "Diseases of the Digestive System" (second edition, 1907) embody the scientific knowledge and clinical experience of a physician who pursued in the laboratory the studies begun in the wards of a large hospital, and was well acquainted with the writings of other workers in the same domain. Besides these monographs, Dr. Saundby made considerable contributions to medical literature in the form of articles and scholarly addresses. The scientific attitude of his mind was strongly reflected in his clinical work and in his lifelong interest in research. To the last he was receptive of new ideas, and his readiness to test such new methods or findings within his province as attracted his critical faculty kept him continuously abreast of his times. But Dr. Saundby was more than a clinician, and his books on "Medical Ethics" (second edition, 1907) and on "Old Age: Its Care and Treatment" (1913), as well as the distinguished positions to which he was elected by his fellows, bear witness to his strong personality, sound judgment, and versatility. Throughout his career as a consulting physician in busy practice Dr. Saundby's energy and public spirit were further displayed in other fields of professional interest. He was a strenuous supporter of the British Medical Association, holding the office of chairman of the council and becoming president of the association in 1911. He was also a member of the General Medical Council, and at the Royal College of Physicians he was Harveian orator in 1917, lecturing on the congenial theme of "Harvey's Work Considered in Relation to Scientific Knowledge and University Education in his Time."

CONSIDERABLE interest was taken last week in the demonstrations of "reading by ear" at the British Scientific Products Exhibition. The original construction of Dr. Fournier d'Albe's "type-reading optophone" was described in NATURE for September 3, 1914. This construction has recently been modified by replacing the Nernst lamp by a small drawn-wire lamp, and by arranging the whole apparatus in such a manner that any ordinary book or newspaper can be inserted and read without cutting it up into pages or columns. The demonstrations consisted in taking an ordinary book of clear type, opening it at random or at a page chosen by the audience, and asking the blind pupil to read a few words or lines on that page. By a curious coincidence the first words thus read were "in the light." The reader, a girl of nineteen blind from early infancy, was the first blind person to read by ear. She read an unknown page of print without assistance after twenty lessons of one hour each, spent in learning the alphabet and in deciphering words of gradually increasing length. The only letters which offered any real difficulty were *c*, *o*, *p*, and *q*. The Roman alphabet is less suitable for optophone reading than either the Gothic or the Russian alphabet, and it might easily be re-designed so as to increase its legibility. But even as types are now, they are sufficiently legible to make all the literature printed clearly in them freely accessible to the blind through Dr. Fournier d'Albe's very ingenious instrument and by the exercise of reasonable practice in distinguishing the sounds associated with letters and words.

On the linguistic side the Bureau of American Ethnology, according to its thirty-first report, for 1909–10, published in 1916, was specially engaged, under the superintendence of Dr. Franz Boas, in bringing nearly to completion the first volume of the "Handbook of American-Indian Languages." The most important work on the first volume was a thorough revision of the Algonquin sketch by Dr. W. Jones, which she has nearly completed. Miss Densmore is analysing about 500 songs collected from a representative number of localities, which will form a scientific musical study of primitive song. The remainder of the volume of the report is devoted to an exhaustive account of Tsiinshian mythology, based on a series of texts recorded by Mr. H. W. Tate.

Mr. F. B. C. Bradlee contributes to the Historical Collections of the Essex Institute (vol. liv., No. 2, April, 1918) a paper on the Salem Iron Factory, which possesses more than local interest. The first ironworks of any importance were started at Lynn, Massachusetts, in 1643, and the first iron pot made in New England was cast in that foundry in the same year. The Danvers ironworks and rolling mills were founded by Nathan Read, of Salem, whose ancestors came from Newcastle-upon-Tyne. He was born in 1759, and two works were started in 1796. He was the inventor of one of the first machines, and perhaps the earliest, for cutting and heading nails in one operation. Mr. Bradlee in his paper publishes a number of early documents which are of value as a record of this industry in the United States.

Despite the prevalence of war conditions, the Geological Survey of New Zealand continues its handsome series of bulletins with Prof. Jas. Park's memoir on "The Geology of the Oamaru District, North Otago" (1918). This is the typical area for the Oamaruian series, and the Ototara stage is now rescued from what the author calls the "hyphenated" Cretaceo-Tertiary group of former classifications. Everything in the district above the Palæozoic schists is now classed as Miocene or Pleistocene. At the base of the Ototaran strata near Peebles pillow-lavas occur, which were evidently poured out as submarine flows during the deposition of the fossiliferous limestone. The ample lists of molluscs and brachiopods, by Mr. Suter and Dr. J. A. Thomson respectively, establish the Miocene, and probably Middle Miocene, age of the Oamaruian series.

The controversy regarding the relation of magic to religion is again raised in a vigorous manner by Mr. N. W. Thomas in a paper entitled "Magic and Religion: a Criticism of Dr. Jevons" (*Folk-lore*, xxviii., 259), in the same journal, vol. xxix., part 2. Dr. Jevons asserted that we should reserve the term "magic" "exclusively for the proceedings which excite the disapproval of the community," which, as his critic points out, includes under the head of "magic" not only all crime, but also offences against etiquette. "To frame an adequate definition of magic, it is necessary to survey the whole field of primitive rites and to group the facts according to their natural affinities without regard to the terminology of the reporter. In only too many cases the native view cannot be discovered; failing some knowledge of the language, the observer falls back on his own preconceptions, and while we get a good account of the details of a rite, we get none of the atmosphere with which the native mind surrounds it."

The peoples of Austria are statistically considered by Mr. B. C. Wallis in a paper in the July issue of the *Geographical Review* (vol. vi., No. 1), which is accompanied by several excellent maps in colour. Three of these maps show respectively the relief of the land, the density of population, and the distribution of nationalities. The last map illustrates the patchwork of races of which Austria consists, and shows clearly that in most of Austria the inhabitants are not of Teutonic race, and that there is no race characteristic to Austria like the Magyars to Hungary. Czechs, Poles, Ruthenians, and Rumanians form 50 to 95 per cent. of the population in different parts of northern Austria. From Carinthia and the Tyrol southwards Italians and Slavs are the predominating races. This leaves a comparatively restricted area, comprising principally the mountains of the centre and the Danube valley, in which Germans predominate. Mr. Wallis believes that if the principle of nationality is given due consideration in the final settlement, the outlooks of Germany eastward and towards the Mediterranean will be barred, and that the Germans of Austria will be separated from the Prussians by the Czechs. The best lands of Austria will no longer be in German hands. The paper raises many interesting issues, and contains many facts essential to any understanding of the settlement of the Austrian question.

An account of the amphibians collected by the American Museum Expedition to Nicaragua in 1916 appears in the Bulletin of the American Museum of Natural History, vol. xxxviii., pp. 311–47. Though, of necessity, very technical in character, it yet contains some noteworthy observations in regard to the life-histories of these animals, especially in relation to coloration and structural variations. A good instance of the latter is furnished by a tiny tree-frog, no more than 16 millimetres in length. New to science, and designated *Hyla chica*, this little creature displays a striking range of variation in regard to the digital expansion used in climbing, and a no less marked reduction of the webs of the toes. *Agalychnis helenae*, another small tree-frog, showed chameleonic changes of colour which were not, apparently, due to changes in the intensity of the light. Finally, stress is laid upon the profound alterations of colour which take place in specimens preserved in spirit.

The annual report for 1917 of the New Jersey Department of Conservation and Development insists on the abolition of all legislation framed for the protection of deer and rabbits within the boundaries of the State; and this because of the depredations of the deer, which, driven out of the forest by fires caused by deer-hunters, raid the crops of the farmers. It is contended that material interests of great value are being sacrificed to sport. But, judging from the report, hunters in this State are accorded a surprising licence. Strenuous efforts are urged to drain some 300,000 acres of marshland, now infested with mosquitoes, in order that they may become available for cultivation; and for this work it is suggested prison-labour should be employed. The forest fire service report, included in this volume, proves interesting reading, if only for the insight it affords into the management of large forests in view of our own afforestation schemes.

The collection of sea-anemones made by the *Terra Nova* Expedition is described by Mr. T. A. Stephenson (British Antarctic *Terra Nova* Exp., 1910, Zool., vol. v., No. 1, pp 1–68, 6 pls., 1918). Fifteen genera, all belonging to the Actiniina, are represented, each by a single species. The author describes as new five genera and eleven species. Seven species were obtained in the vicinity of McMurdo Sound, and two of these were also taken in Ross Sea. All these were dredged from deep water, and most of them have a thick, stiff body-wall. The remaining eight species were collected in New Zealand, off Rio de Janeiro, off the Falkland Islands, and at South Trinidad Island. A careful description is given of each species, and, thanks to the excellent preservation of the material, an account of the histology of most of them is added. In the examples of Leptoteichus, Bolocera, and Cymbactis the author found numerous zooxanthellæ in or around the gonads, and in Phymactis the greater part of the mesoglœa of the mesenterial filaments is crowded with small zooxanthellæ.

WE have recently received three additional parts of vol. v. of the Scientific Reports of the Australasian Antarctic Expedition, 1911–14. In part ii. (5 pp.) Miss Mary J. Rathbun gives an account of the crabs which are referable to three species, two of which are well-known species of Halicarcinus and Nectocarcinus. The third is a megalops stage of large size, taken off Macquarie Island, and described as *Marestia mawsoni*, n.sp. In part iii. (48 pp., 15 pls.) Prof. G. S. Brady reports on the Copepoda from the tow-nettings; fifty-three species are noted, twenty-five of which are described as new. The species fall into thirty-eight genera, six of which are new. Several of the more prevalent Antarctic forms in the collection were previously known only from Giesbrecht's descriptions in his report on the collection made by the *Belgica*. These seem to be purely Antarctic species, while a few others, *e.g. Calanus propinquus*, seem to be almost cosmopolitan in distribution. In part iv. (11 pp., 2 pls.) Prof. Brady gives an account of the Cladocera and of the Ostracod family Halocypridæ.

THE diminution of foreign imports into India has forced the Forest Department to exploit local sources of supply. Home-grown timber is now largely used for industrial purposes. Indian walnut has lately replaced the European variety for rifle-stocks; Chir pine has been found equal to that of Oregon for gun-carriages, and Himalayan spruce is little inferior to the famous Sitka variety for the manufacture of aircraft. Materials for paper are being successfully utilised, and tar for the Calcutta jute industry is being distilled in the Punjab. A solution of gum from *Bauhinia retusa* has been successfully used as a binding material for making charcoal briquettes. On the whole, the efforts of the Forest Department to utilise indigenous resources have been well conceived, and promise to be financially successful.

THE Geological Survey of Great Britain, in the sixth volume of its special reports on the mineral resources of the country (1918, 7*s*. 6*d*.), describes the occurrences of refractory materials, including dolomite. Dr. J. W. Mellor has furnished tests of many of the samples. One of several interesting points is the present demand for calcined dolomite as a lining for converters or for the beds of open-hearth furnaces in steel manufacture. The rock should be a compact, nearly pure dolomite—that is, with some 21 per cent. of magnesia. Silica should not exceed 2 per cent. The manufacture of silica bricks from ganister and quartzite is also described. The crushed rock is usually bound by an addition of some 1·5 per cent. of lime during grinding, and the moulded bricks are fired at a temperature of about 1500° C.

WE have received from the Palæontological Laboratory of Yale University a collection of reprints detailing the results of the recent activities of Prof. Charles Schuchert and his associates. They are very varied, ranging from notes on the Palæozoic rocks in the Grand Cañon of the Colorado to the evolution of Palæozoic corals and the function of the so-called sacral brain in dinosaurs. One paper by Prof. R. S. Lull (from *Amer. Journ. Sci.*, May, 1918) is a welcome contribution to our knowledge of the footprints of Carboniferous land vertebrates. The animals which made these prints are still unknown, but they seem to have been very bulky, small creatures with sprawling legs, having broad, stumpy feet and four toes in front, five toes behind. The absence of any trace of the tail shows that the body was carried clear of the ground.

METEOROLOGICAL tables giving the mean values in 1917 for the several elements at Falmouth are published in the "Report of the Observatory Committee of the Royal Cornwall Polytechnic Society," and some notes of interest are added. The minimum barometer reading for the year, 970·0 mb. or 28·645 in., was recorded on August 27; it is the only instance that the minimum pressure has occurred at the observatory in the month of August. Air temperature had a mean of 49·4° for the year, which is the lowest since observations were commenced in 1882; the next lowest annual mean was 50·2° in 1888. From January 14 to February 3, a period of eighteen days, the maximum temperature only once reached 40°, apparently an unprecedented circumstance in the district. The total rainfall was 36·21 in., which is 9·58 in. below the average of the forty-five years, 1871–1915. The minimum fall in any month was 1·83 in., in December, which is the lowest record for that month, and is in marked contrast to 11·14 in. measured in December, 1915. Bright sunshine registered 1632 hours during the year, which is 132 hours fewer than the mean for the thirty-five years 1881 to 1915. In an easterly gale on January 27 the height to which the water washed the cliffs is stated to be unprecedented so far as is known. A table of sea temperature values is given, and as the means at the station are now available for about forty years, the results are of considerable value. Some improvement might probably be made by comparing the sea temperature mean for the several months with the corresponding days of air temperature, instead of with the means of air temperature for the several months, and the maximum and minimum comparisons seem also open to question. The new scale values are not systematically used, but this is probably a matter of time, as with many other observatories.

THE manufacture of synthetic indigo in Germany is still considerably hampered through shortage of raw materials (*Zeitschrift für angewandte Chemie*, June 21). The recent discovery of a practical source of acetic acid in calcium carbide has given new life to the industry by securing supplies of one of the most important raw materials. The relatively high prices for synthetic indigo have favoured the cultivation of the indigo plant in Eastern countries. Two large factories in the United States have commenced the manufacture of artificial indigo.

Dagens Nyheter, Stockholm, reports that it has been decided to install a high-power wireless station at Karlsborg. The range is 5000 km., and the masts will be 210 m. high, and weigh only 25 tons. The radiating system is formed of 60 phosphor-bronze wires 450 m. long. A balancing antenna is provided, consisting of a bronze wire 1 mm. thick, suspended 5 m. above the ground over the entire area of the station. The energy will be supplied from the generating station at Trolhättan, and an emergency generator is installed at the station.

A REMARK in NATURE of August 22, p. 493, referring to the use of Moissan's electric furnace for the production of pure substances, and stating that these "rendered possible the practical achievements of Sir Robert Hadfield and other great steel-makers," needs correction for the sake of historical accuracy. Sir Robert Hadfield's epoch-making experiments, which led to the production of his famous manganese steel, were made in 1882, and neither for this nor for the other valuable iron alloys invented by him was he indebted to Moissan's work. It was not until ten years later that Moissan turned his attention to high-temperature research, and by the preparation of chromium, tungsten, molybdenum, uranium, and many other metals in a fused form and high degree of purity enriched our knowledge of the chemical and physical properties of these elements.

IN accordance with its usual practice of late years, the Royal Meteorological Institute of the Netherlands has issued copies of the most disturbed magnetic curves obtained at De Bilt during 1916. The records cover seven sheets, and deal with twelve separate periods, each of thirty hours. There are traces in each case of D (declination), H (horizontal force), and V (vertical force). The D and H scale-values were practically constant throughout, the respective equivalents of 1 mm. of ordinate being 1·06′ and 3·4 γ, but the equivalent of 1 mm. in the V curves varies from 1·14 γ to 3·31 γ. Some of the disturbances were of considerable amplitude, but none at all outstanding. There are several good examples of "sudden commencements." The largest movement of this kind in H occurred on August 26, and was decidedly oscillatory. The usual tendency for the evening hours to be more disturbed than the forenoon is pronounced. Also, in nearly every case the value of V is enhanced in the late afternoon, up to at least 10 or 11 p.m., and depressed in the early morning hours. This is especially well illustrated in the two sets of curves numbered 2 and 3, which cover the sixty consecutive hours commencing at 7 a.m. on March 8. On most occasions short-period oscillations are prominent in the D and H curves during at least part of the storm. On some occasions, notably on November 12, these were of considerable amplitude, especially in H.

OUR ASTRONOMICAL COLUMN.

INFRA-RED STELLAR SPECTRA.—Some interesting experiments on the photography of stellar spectra in the extreme red have been made by Dr. P. W. Merrill, of the Bureau of Standards, Washington (Scientific Papers, No. 318). The actual tests were made at the Harvard College Observatory, where use was made of the 24-in. reflector, combined with objective prisms of different dispersions. The plates were sensitised for the red by staining with dicyanin, and pinaverdol was added when it was desired to photograph the yellow and green in addition. A large number of spectra of typical stars was obtained, with exposures ranging from 5 to 112 minutes, reaching in some cases as far as λ 870, and showing the atmospheric absorption bands B, *a*, and A. Several examples are reproduced, and it is clear that results of considerable value to astronomers and physicists may be obtained in the future by this method. Among other results of interest Dr. Merrill has found a new absorption band in the spectra of the M stars at wave-length 760, which he has proved by laboratory experiments to belong to the titanium oxide series; in Mira there is possibly still another band between 810 and 820. In stars of class N new bands have been found at 692, 708, and 723, and these differ from the characteristic bands of carbon in degenerating towards the less refrangible part of the spectrum; it is suggested that they may possibly be due to cyanogen. The great contrast in energy distribution in the different classes of stars is very strongly emphasised by the extended range of observation. For classes B and A the blue portion is much the stronger; at class K the blue and red are about equal; while for classes M and N the red is the stronger.

MOUNT WILSON OBSERVATORY REPORT.—Although the director has been called upon to devote nearly all his time to the organisation and work of the National Research Council, the research activity at the Mount Wilson Observatory appears to have been so far well maintained. The report for 1917 refers to many subjects of the highest interest and importance, and it is only possible to mention a few developments to which attention has not previously been directed. The 75-ft. spectrograph has been adapted for visual observations in conjunction with the 150-ft. tower telescope, and the magnetic polarities of an average number of forty sun-spots were determined on each day of observation, besides measurements of the strength of field in a large percentage of these spots. Further tests of the presence of free electricity in sun-spots were also made, but, as in previous years, Stark effects were not observed, and the results were negative. The interesting results obtained by stereoscopic combinations of H_α images of the sun have been extended, and the method has been found extremely valuable in the study of prominences projected on the disc, and in showing their connection with the dark flocculi. Systematic work on the solar rotation is being continued with the greatest refinements, and it is hoped eventually to determine whether the suggested variations in the period are real, or depend upon instrumental conditions and personal equation. Stellar and nebular investigations continued to increase in several directions, and work on the parallaxes, proper motions, magnitudes, and distribution of the stars has been very fruitful. Of exceptional significance in the theory of stellar evolution is the definite conclusion that the intrinsically fainter stars move more rapidly than the brighter ones, irrespective of their distances from the sun. To facilitate the experimental work, which is so fundamental for the interpretation of celestial spectra, the physical laboratory in Pasadena has been enlarged to nearly double its former area, and additional equipment has been provided. Good progress was also made with the 100-in. reflector, the dome and mounting having been essentially completed, and the great mirror safely conveyed to the top of the mountain; it is expected that the telescope will be ready for test observations during the autumn.

THE DEVELOPMENT OF NEW INDUSTRIES.

A FACT brought to light at the British Scientific Products Exhibition, organised by the British Science Guild at King's College, is the dependence of industrial development upon the intelligent application of scientific knowledge and method. In most of the industries represented at the exhibition it is shown that the resources exist and that they merely await the application of the results of scientific research for their proper development, and the introduction of patient and persistent effort to turn these industries into successful commercial undertakings. The case of timber furnishes an example of our pre-war dependence upon supplies from abroad, when, in point of fact, the bulk of our demands could have been satisfied by home or Colonial supplies. For a long time it